

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/054651 A1

(51) International Patent Classification⁷: **F02D 41/02**,
41/14

KAISHA, 1, Toyota-cho, Toyota-shi, Aichi 4718571 (JP).
AKIYOSHI, Asuka [JP/JP]; c/o TOYOTA JIDOSHA KABUSHIKI KAISHA, 1, Toyota-cho, Toyota-shi, Aichi 4718571 (JP).

(21) International Application Number:
PCT/JP2004/018081

(74) Agents: **YAMAMOTO, Koji** et al.; c/o TOKYO CENTRAL PATENT FIRM, 4th Floor, Oak Building Kyobashi, 16-10, Kyobashi 1-chome, Chuou-ku, Tokyo 1040031 (JP).

(22) International Filing Date:
29 November 2004 (29.11.2004)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

(26) Publication Language: English

(30) Priority Data:
2003-403078 2 December 2003 (02.12.2003) JP

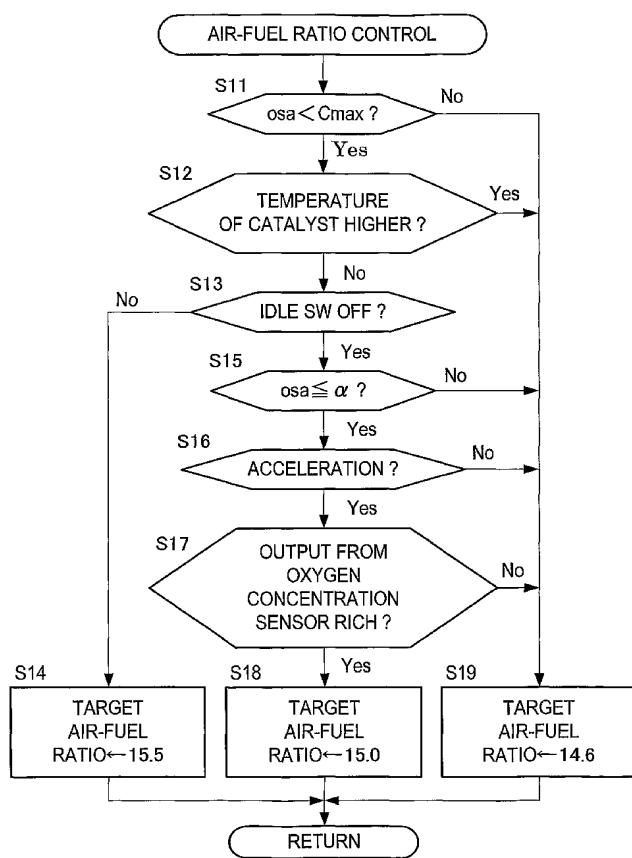
(71) Applicant (for all designated States except US): **TOYOTA JIDOSHA KABUSHIKI KAISHA** [JP/JP]; 1, Toyota-cho, Toyota-shi, Aichi 4718571 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **NAKAGAWA, Norihisa** [JP/JP]; c/o TOYOTA JIDOSHA KABUSHIKI

[Continued on next page]

(54) Title: AIR-FUEL RATIO CONTROL APPARATUS OF INTERNAL COMBUSTION ENGINE



(57) Abstract: An air-fuel ratio control apparatus of an internal combustion engine includes first and second catalysts 10 and 12, first air-fuel ratio acquiring means 8 provided upstream of the first catalyst, for acquiring an air-fuel ratio of exhaust gas; second air-fuel ratio acquiring means 11 for acquiring an air-fuel ratio of the exhaust gas flowing into the second catalyst, and air-fuel ratio controlling means 13 for controlling an air-fuel ratio according to the air-fuel ratios acquired by the first and second air-fuel ratio acquiring means, and the air-fuel ratio controlling means is provided with lean control means 13 for controlling an air-fuel ratio until the second catalyst becomes lean after completion of a fuel quantity increasing operation of the engine, and intermediate lean control means 13 for performing control to change the air-fuel ratio to a lean air-fuel ratio within the range enough to make the first catalyst lean and not enough to make the second catalyst lean, between the fuel quantity increasing operation and the air-fuel ratio control by the lean control means.

WO 2005/054651 A1



GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.